

## Chapter IV Study Site and Agricultural Production

This chapter was divided into two sections. The first section aimed to describe the characteristics of study site including topography, climatic condition, soil characteristics and social economic conditions. The second section analysed cropping systems and farmer practice in some main crops in the study site.

### 4.1 Study sites

#### 4.1.1 Physical characteristics

Son La is a mountainous province far from Hanoi about 350 km from the Northwest (figure 1), the elevation range from 500 to 900 meters above the sea level (msl). It border with Lao Cai province in the North, Yen Bai and Phu Tho in the Eastern, Hoa Binh in the Southeast, and Thanh Hoa province, Lai Chau province in the West and Laos country in the South.

*Topography:* The adulating topography and calcium Rock Mountain chains, which divided its territory into different parts. The high parts with elevation ranges from 700 to 900 meters (msl), which mainly are Rock Mountain and forest area. The middle parts having elevation ranges from 400 to 700 meters (msl), which consist of soil hills. The low parts having elevation less than 400 meters (msl), which consist of lower soil hills and narrow valleys.

*Climatic condition:* Son La is dominated by monsoon climatic condition. There are four seasons, spring season from February to April, summer season from May to August, autumn season from September to October and the winter season from November to January. The temperature ranges from 10-17<sup>0</sup>C; the lowest temperature usually occurs in January and February, particularly that strongly effect to crops because of the low temperature is a factor to shorten the length of growing season. The statistics of rainfall, temperature and other elements are showed in figure 3 and appendix Table 1.

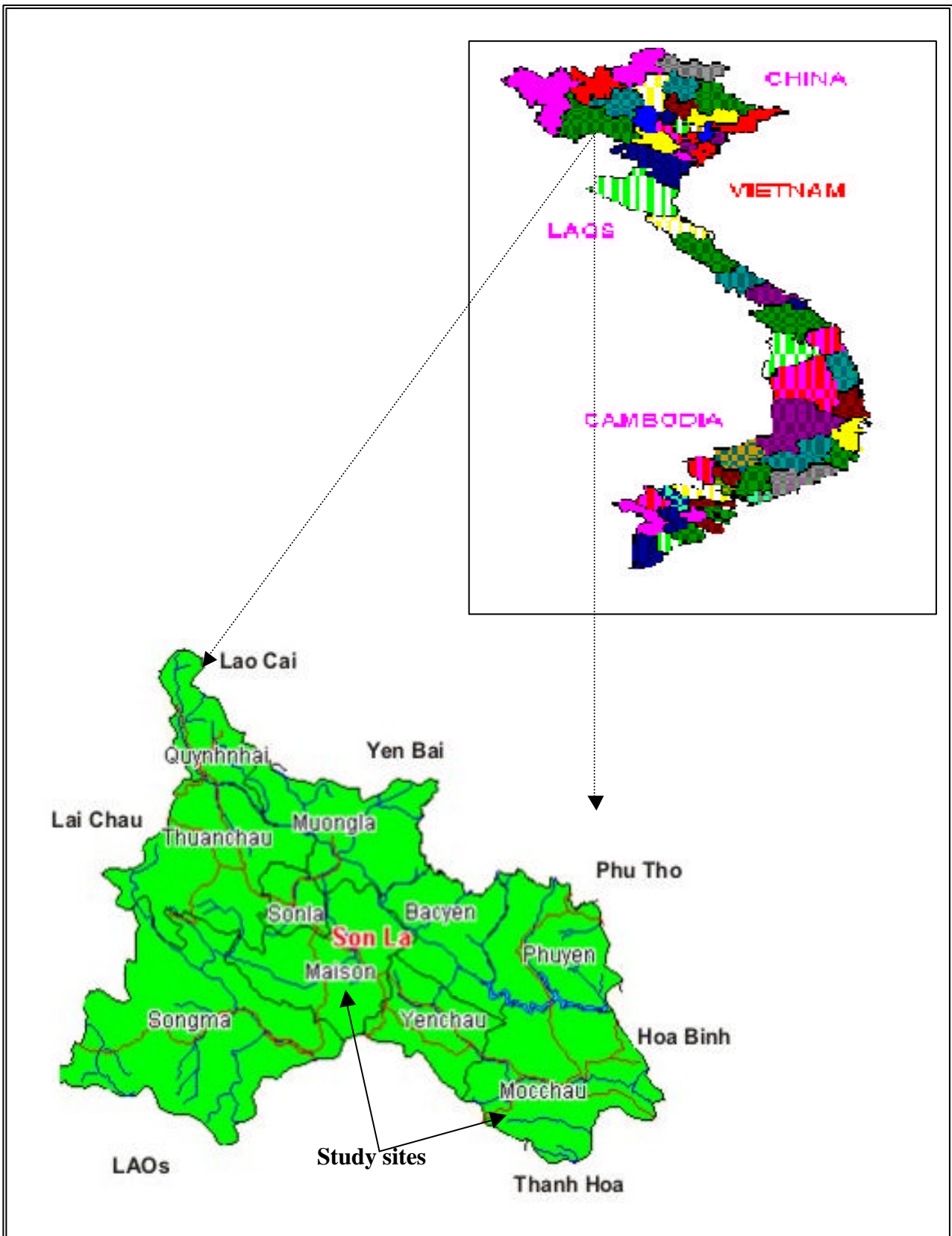


Figure 1: The map of Vietnam and Son La Province showed study sites

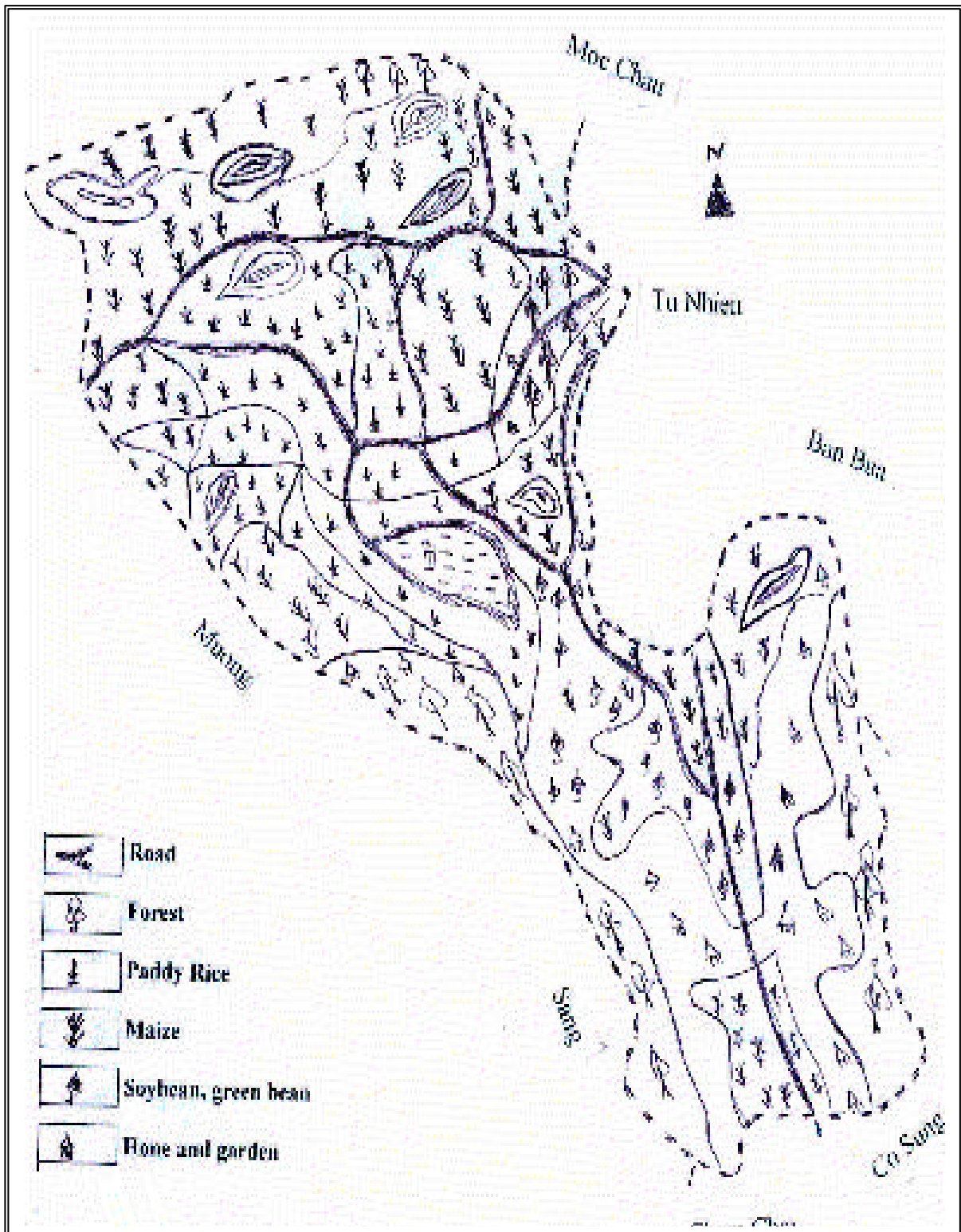


Figure 2. The resource map of Ang village

The annual rainfall in this region was quite high and erratic, total annually rainfall ranges from 1400 millimetres to 2000 millimetres and fluctuation year to years. Because of variation of topography, the amount of rainfall varied from location to location within province.

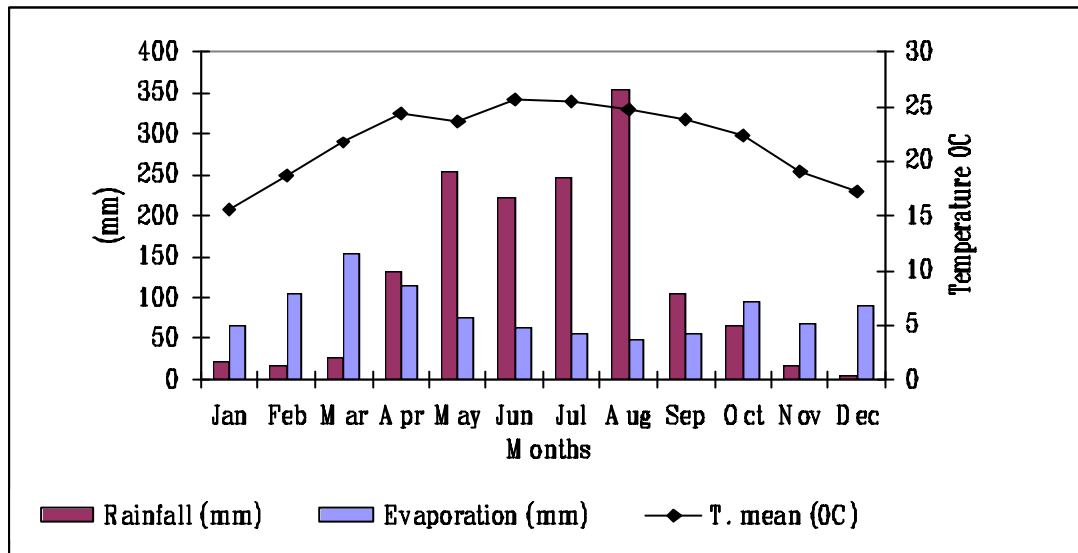


Figure 3 Climatic characteristics in Son La province

Source: *Metrological state, 2002.*

To assess the effect of rainfall to agriculture we consider not only the total of rainfall but also the rainfall distribution within parts of province. The data in figure 3 showed that the rainy season starting from April to August with 70-80 percent total of rainfall. Dry season from the September to March of the next year, amount of rainfall was very small about 20-30 percent of total rainfall. The shortage of water in dry season has strongly affected agricultural performances so that all of agricultural activities in the rainfed area of Son La province mostly concentrated in the rainy season from April to August annually.

*Soil characteristics:* Complexity of topography and different material rocks has formed into different soil types in Son La province. There are four major soil groups namely by FAO-UNESCO are Calcic Luvisols (LVk), Luvic Calcisols (CLI), Rhodic Ferralsols (FRr) and Xanthic Ferralsols (FRX) which are distributed in different locations of Son La province.

Calcic Luvisols was formed in the calcium rock material, which mostly concentrated in the valleys and flatland area. The characteristics of this soil type are the top soil layer have black color, high porosity,  $\text{pH}_{\text{kcl}}$  is about 6.2, rich in organic matter 3.8 percent, total nitrogen is about 0.17 percent, phosphorous is 0.1 percent, potassium is about 0.92 percent, and Cation exchange capacity is 17.2. In general, this is a good soil type and high suitable for agricultural production. However, the area of this soil types in Son La occupies with small area about less than 8-10 percent of total area of Son La province.

Table 2 Soil characteristics of some major soil groups in Son La province

Items	Calcic Luvisols	Luvic Calcisols	Rhodic Ferralsols	Xanthic Ferralsols
PH kcl	6.2	7.6	4.6	4.1
OM %	3.8	1.83	1.29	1.54
N %	0.17	0.16	0.10	0.13
P <sub>2</sub> O <sub>5</sub> %	0.1	0.13	0.42	0.15
K <sub>2</sub> O %	0.92	0.41	0.07	0.64
CEC me/100	17.2	30.5	12.0	13.4
Ca <sup>++</sup> me/100g	10.4	27.2	2.75	1.00
Mg <sup>++</sup> me/100g	4.2	0.6	1.8	1.52
Available P <sub>2</sub> O <sub>5</sub> mg/100g	NA	NA	NA	2.12
Available K <sub>2</sub> O mg/100g	NA	NA	Na	4.60
Base saturation V %	88.0	89.0	43.0	36.0
Soil texture (%)				
> 0.05mm	50	25	20.6	20.2
0.05-0.002 mm	38	30	25.8	17.6
< 0.002 mm	12	45	57.7	62.6

Source: *Moi et al., 1997.*

Luvic Calcisols was formed in the valleys of calcium Rock Mountains. The characteristics of this soil types are the topsoil layer have brow color, medium to high porosity,  $\text{pH}_{\text{kcl}}$  7.6, organic matter is about 1.83 percent, total nitrogen is about 0.16 percent phosphorous is 0.13 percent, potassium is about 0.41 percent, and cation exchange capacity is quite high is 30.5. Like Calcic Luvisols, this soil type is also suitable for agricultural production and the area of this soil types occupies about 10-12 percent of total land area.

Rhodic Ferralsols and Xanthic Ferralsols are two major groups, which occupy with largest area about 70-80 percent of total land area and mainly concentrated in the

midland and steep land area. The topsoil layer has brown-red and brown-yellow color, soil porosity ranges from low to medium, low pH<sub>kcl</sub> ranges 4.1-4.6, organic matter content quite low 1.29-1.54 percent, total nitrogen is about 0.1-0.13 percent, phosphorus is about 0.15-0.42 percent and low Cation Exchange Capacity is about 12-13.4. These soil types are suffering from soil erosion, some areas have become the soil have problems for agricultural production such as acid soil, degraded soil.

#### 4.1.2 Social and economic characteristics

Moc Chau and Mai Son are two agricultural mountainous districts were selected for study with total land area 202,513.0 ha and 141,026.0 ha, occupied 14.4 percent and 10.03 percent of Son La province (Statistic book 2000). Land was divided into forestland, agricultural land, unused land and other lands. Population consists of 10 ethnic minorities in which Thai, Kinh and Tay, Muong are big groups. More than 90 percent of peoples live in agricultural production, of which Moc Chau occupied 97 percent and Mai Son occupied about 98 percent (Table 3).

The infrastructure systems in these areas is extremely poor, road system, health care service, education system and electricity network are inadequate, information and market accessibility are difficulty that has affected the life quality of local peoples, especially, the quality life of minority people groups in the highland area.

Agricultural production was affected by physical characteristics (both low temperature and sloping land) and social circumstances which in turn to low crop productivity. Per capita average of food product was 290-310 kg per year (Table 3) so that the lack of food and poverty are still problems in minority groups due to limitation in land cultivation, traditional cultivation techniques and poor crop year to year.

Table 3 Land distribution and social-economic situation in Moc Chau and Mai Son

Items	Unit	Moc Chau district		Mai Son district	
		Amount	%	Amount	%
<b>A. Land distribution</b>					
<b>Total of land area</b>	<b>ha</b>	<b>202,513.0</b>	<b>100.0</b>	<b>141,026.0</b>	<b>100.0</b>
Agricultural land	ha	32,532.2	16.0	29,323.7	20.7
Forest land	ha	38,867.0	19.1	26,897.5	19.0
Unused land		126,228.1	62.3	83,814.3	59.4
Other land*	ha	1,484.95	0.73	990.4	0.70
<b>B. Social aspects</b>					
<b>Population</b>					
	person	131,400.0	100.0	90,780.0	100.0
Numbers of household		23,975.0	-	22,695.0	-
Agricultural population	person	127,458.0	97.0	88,965.0	98.0
Agricultural labor	person	55,600	42.3	53,379.0	58.8
Non agricultural population	person	3,942.0	3.0	1,815.0	2.0
Male	person	67,014.0	51.0	48,113.0	53.0
Female	person	64,386.0	49.0	42,667.0	47.0
<b>Minority</b>					
Kinh	%	10.0	-	30.0	-
Thai	%	60.0	-	50.0	-
Tay & Nung	%	15.0	-	10.0	-
Muong		10.0	-	5.0	-
Dao, H.mong, Man, and others	%	5.0	-	5.0	-
<b>C. Economic</b>					
Average income per capita	000vnd	1,200.0	-	1,500.0	-
Food amount per capita	kg	290	-	310	-

Source: Moc Chau and Mai Son statistical division, 2002, Other lands: land used for community purposes

Land allocation policy was launched in 1993 by Government with long-term land use right was given to farmer households. This was an important change in governmental development policy to motivate in agricultural production. Particularly, there were many new varieties, such as hybrid rice, hybrid maize, sugarcane, coffee, mulberry, tea and fruit trees such as litchi, logan, plum and apricot, which were introduced to farmers and applied in production.

#### 4.2 Agricultural production

Agricultural production in two districts was divided into two ecosystems consisted of lowland and upland area. The lowland area were mainly used for paddy rice cultivation, the average rice yield obtained from 3.7 to 4.3 tons per hectare in Moc Chau and Mai Son, respectively. Most of crops were produced in the upland

area, in which maize, cassava and sugarcane are major crops. The maize yield obtained from 3.05 tons per hectare to 3.24 tons per hectare, the cassava yield obtained from 13.6 to 15.4 tons per hectare and sugarcane yield from 31.0 to 33.4 tons per hectare. Upland rice was cultivated in the steepland, the average yield obtained 1.65 to 1.83 tons per hectare, respectively. Green bean and soybean occupied with small area, which was cultivated either mixed or intercropped with maize or cassava. The average yield of soybean and green bean obtained roundly 2.0 tons per hectare. The rest of upland area have been used for industrial crops, such as coffee and mulberry and fruit trees, such as plum, Logan, litchi and apricot. The total product of each crop also presented in Table 4.

Table 4 Productivity and area of main crops in Moc Chau and Mai Son districts

Crops	Moc chau			Mai son		
	Area	Yield	T.Product	Area	Yield	T.Product
	(ha)	tons/ha	tons/ha	(ha)	tons/ha	tons/ha
L.land rice	1,600.4	3.7	5,921.5	1,620.7	4.35	7,050.0
Upland rice	762.70	1.6	1,258.45	470.00	1.83	860.10
Maize	10,863.0	3.2	35,196.1	8,654.50	3.05	26,396.2
Cassava	6,250.0	13.6	85,000.0	4,816.00	15.40	7,4166.4
Soybean	2,300.0	2.1	4,830.0	1,700.0	2.40	4,080.0
Green Bean	840.1	2.0	1,705.4	475.20	1.76	836.35
Sugarcane	1,346.0	33.4	44,956.4	7,650.40	31.00	237,162.4
Coffee	14.5	-	-	27.50	-	-
Mulberry	11.6	-	-	12.60	-	-
Fruit trees	1,243.6	11.2	14,002.9	668.70	13.2	8,826.8

Source: Moc Chau and Mai Son Agricultural Department, 2002

#### 4.2.1 Land use in villages

Table 5 showed that upland area is a major part of surveyed villages, which was divided into three land types, which consists of steepland, midland and flatland area, in which largest area is the midland area, occupies more than 50 percent of the upland with slope ranging from 15<sup>0</sup> to 25<sup>0</sup>. The flatland area, with slope less than 10<sup>0</sup>, are low hills and narrow valleys, which occupies from 5 to 12 percent of upland within surveyed villages. The steepland area occupies 20 to 30 percent of upland area with



slope higher than  $25^{\circ}$ , where dominated by forest trees and regenerating forest is managed by community.

Table 5. Land distribution in four villages

Items	Unit	Ang		Ban Hoa		Coi Noi		Chieng Ban	
		Amount	%	Amount	%	Amount	%	Amount	%
<b>Total area (ha)</b>	ha	2,765.2	100.0	1,430.0	100.0	9,338.2	100.0	3,424.0	100.0
<b>Topography</b>									
Slope $>25^{\circ}$	ha	868.0	31.3	315.4	22.0	2,959.0	31.6	699.5	20.4
Slope $10-25^{\circ}$	ha	1,452.7	52.5	942.6	65.9	5,043.7	54.0	2,282.4	66.6
Slope $<10^{\circ}$	ha	444.5	16.1	135.9	9.5	1306.1	14.0	442.9	12.4
<b>Land use</b>									
1. Forest areas	ha	735.5	26.5	310.0	21.6	2,959.0	31.6	699.5	20.4
2. Agricultural land	ha	1,086.5	39.3	620.0	43.3	4,468.7	47.8	1,624.0	47.4
Low land rice	ha	94.56	3.4	67.4	4.7	155.5	1.9	137.9	4.5
Upland crops	ha	806.9	29.1	465.0	32.5	4153.2	44.4	1,346.0	39.3
Fruit trees	ha	185.0	3.7	87.5	6.1	160.0	1.7	141.0	4.1
3. Other lands	ha	647.6	23.4	320.0	22.3	1,093.2	11.7	887.5	25.9
4. Unused land	ha	295.6	10.6	180.0	12.5	817.3	8.7	213.0	6.2

Source: Survey 2002.

The forestland area has reduced rapidly because of deforestation to devote for agricultural land. Before 1970, the forestland area occupied from 50 to 60 percent of total land area in these villages. However, at this time, the existing area of forest covered only from 21.6 to 30.0 percent of the total land area in villages (Table 5). All of forest area is secondary forest with low capacity and poor quality, of which bamboo forest occupied about 60.0 percent of forest trees.

Accounting for distribution of land use, Table 5, Figure 4,5,6,7 showed that land area used, as compare with total land area, for agricultural production has 39.3 percent in Ang village, 43.3 percent in Ban Hoa village, 47.4 percent in Chieng Ban and 48 percent in Co Noi village. Of which, land use for wetland rice occupied less than 5 percent of total area, which located near streams network or where could assess to water resources. The field crops consisted of upland rice, maize, cassava, sugarcane,

soybean etc, which were cultivated in the upland area that occupies from 29.1 percent in Ang village, 32.5 percent in Ban Hoa, 39.3 percent in Chieng Ban and 44.47 percent of total land area in Coi Noi village.

Land use for fruit trees in villages occupied with small area, it was about 3.7 percent in Ang, 6.1 percent in Ban Hoa, 1.7 percent in Co Noi and 4.1 percent in Chieng Ban village. These lands mainly belong to home garden and part of land is unsuitable for agricultural production.

The other lands consist of land use for community purposes, such as schools, health care station, road systems, lakes and streams networks etc which occupy about 23.4 percent in Ang, 22.38 percent in Ban Hoa, 11.7 percent in Co Noi and 25.9 percent in Chieng Ban village as compare with total land area of each village.

Unused land varies from 6.2 percent in Chieng Ban to 12.5 percent in Ban Hoa, which mainly are hills and forest area was cut down. These land areas belong to management of community for future development.

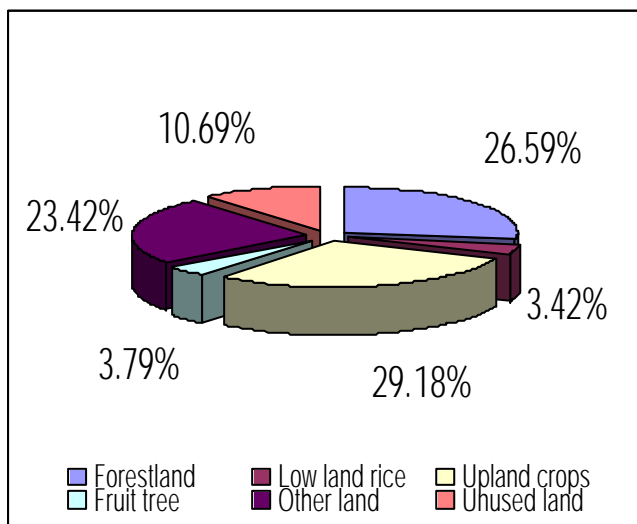


Figure 4. Land use in Ang village

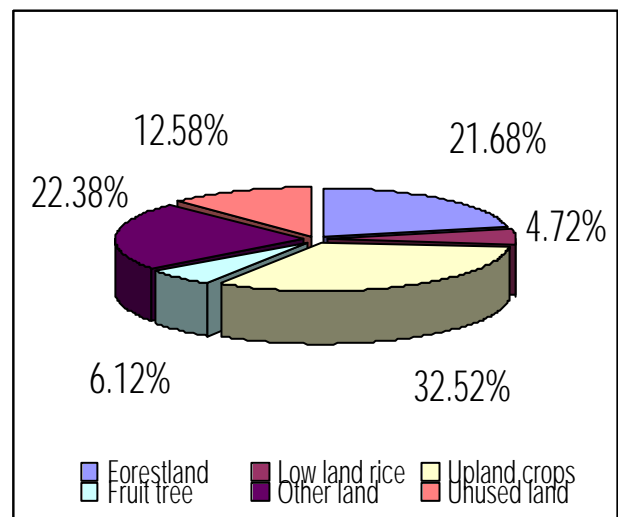


Figure 5. Land use in Ban Hoa village

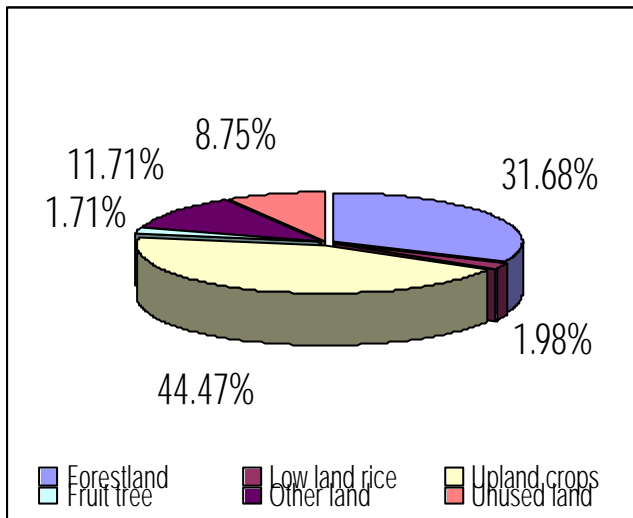


Figure 6. Land use in Co Noi village

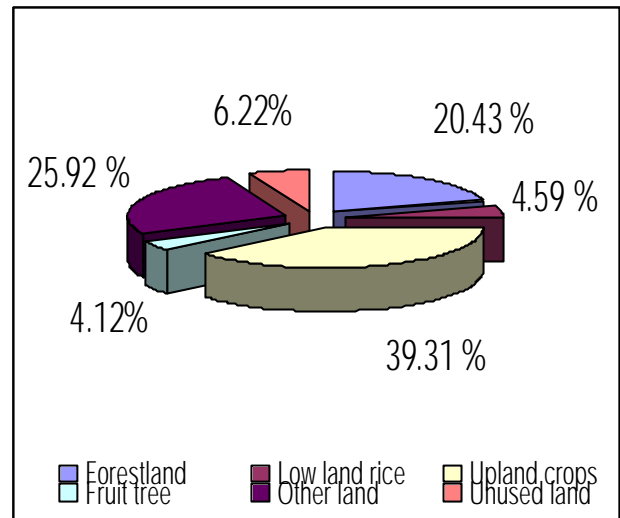


Figure 7. Land use in Chieng Ban village

To focus on land use in household, the data (Table 6) showed that average farm size was about 0.8 to 1.3 ha/family, it was divided into many small plots (7-10 plots). Making comparison of land use among crops (Table 6) showed that the ratio of land used for maize was highest in all survey villages, it varied from 0.3 to 0.5 ha per household and maize is considered as a major crop in the upland area. Cassava and sugarcane are seemed as the second crops except for the Ang village have no sugarcane, the average area per household from 0.11 to 0.25 ha and 0.06 to 0.27 ha, respectively. The other crops, such as soybean, green bean were cultivated with small area and mainly provided to home consumption and surplus for local market.

Table 6 Land use of household in villages

Items	Unit	Ang		Ban Hoa		Coi Noi		Chieng Ban	
		Amount	SD	Amount	SD	Amount	SD	Amount	SD
Total area	ha	0.87	0.24	0.94	0.3	1.37	0.55	0.97	0.36
No. of plot	plots	9.73	3.75	8.87	4.01	7.76	3.75	8.63	3.94
Land use:									
Low land rice	ha	0.11	0.09	0.09	0.04	0.13	0.07	0.08	0.06
Upland rice	ha	0.04	0.06	0.05	0.05	0.06	0.08	0.06	0.09
Maize	ha	0.37	0.20	0.26	0.23	0.53	0.35	0.34	0.31
Cassava	ha	0.14	0.15	0.25	0.22	0.18	0.14	0.11	0.16
Soybean	ha	0.06	0.07	0.03	0.05	0.04	0.08	0.10	0.11
Green Bean	ha	0.02	0.03	0.02	0.03	0.00	0.00	0.03	0.04
Sugarcane	ha	0.00	0.00	0.06	0.07	0.27	0.28	0.11	0.09
Fruit trees	ha	0.12	0.05	0.18	0.12	0.15	0.13	0.12	0.06

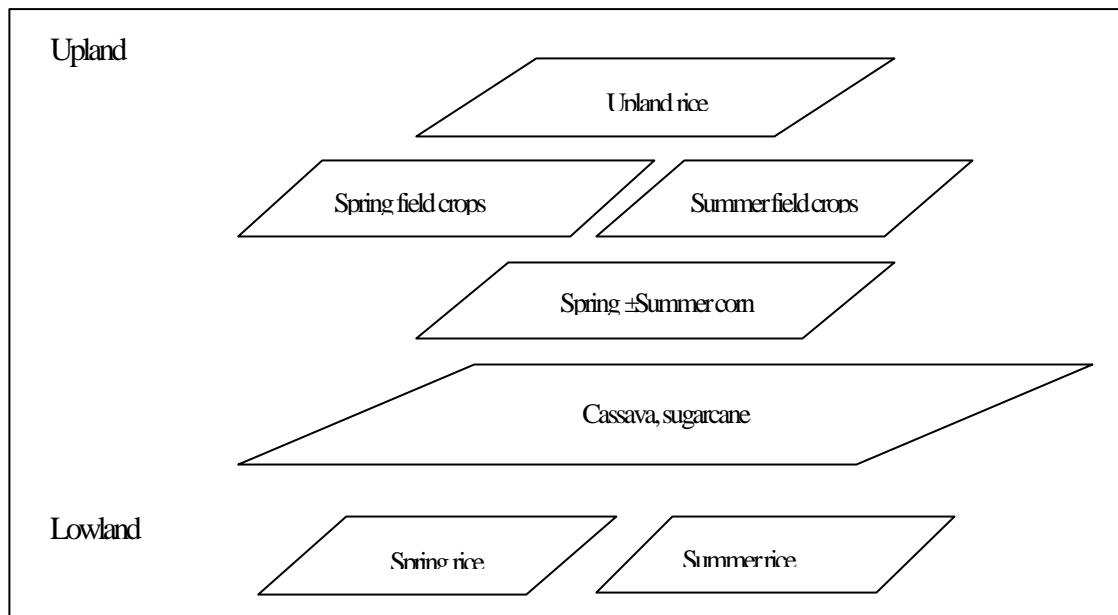
*Source: Survey, 2002*

Land used for fruit trees, such as logan, litchi, plum and apricot etc mostly planted in home garden or on the land areas that unsuitable for agricultural production, the average land size for fruit tree production varies from 0.12 to 0.18 ha/family (Table 6)

#### 4.2.2 Cropping systems

Complexity of topography, climate condition and traditional cultivation has impacted on the existing cropping systems. The existing cropping systems are very simple with popularity of monoculture in the upland area. The dominant cropping systems in the area are described as follow (figure 8)

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Jan Feb Mar Apr May Jun July Aug Sep Oct Nov Dec

Figure 8: Cropping systems in the rainfed area

Source: Group discussion, 2002.

1. Slash and burn practices: The main crops are upland rice and local maize varieties; these crops were cultivated with small plots in the steep land area. The growing season was from April to July or August.

2. Field crops in the upland area: The crops consisted of maize, cassava, sugarcane, soybean, and green bean etc in either monoculture or mix crop or intercropping practices. Monoculture was major field practices and applied for maize cassava and sugarcane cultivation. Two later practices were not commonly used in this area, there were few farmer households intercropped maize with legumes crops such as green bean and soybean (Appendix Table 6).

3. Lowland rice: commonly in the rainfed area, the paddy rice was planted only one crop per year. The growing season is from April or May to September, the old rice varieties have replaced by using the high yielding varieties, such as CR 203, Kang Dan, San Uu etc. Some areas having available water resources, farmers could grow two rice per year are spring rice from February to June and summer rice from June to October.

### 4.2.3 Farmer practices on some main crops

Lowland rice was cultivated along stream networks or where having available water resources. The results of survey (Table 7, Table 8) showed that in the lowland, the high yielding varieties were used, such as CR 203, Khang Dan, and San Uu etc. Land preparation was done before transplanting by cattle powers. The average input use for rice consisted of farmyard manure (FYM) from 2.9 to 4.7 tons per hectare, nitrogen from 74.9 to 106.9 kg per hectare, phosphorous from 46.8 to 63.4 kg per hectare and potassium from 48.3 to 82.8 kg per hectare. Weeding was conducted from 1-2 times; the first time was conducted after transplanting 15 days and the second time after 45-50 days of transplanting. Pest control was conducted from 2-3 times, it depends on the density and frequency of insects appears on the field. Consequently, the average rice yield returned from 3.7 to 4.8 tons per hectare.

Upland rice was cultivated with small area in the steepland area. Traditional agriculture, slash and burn, was applied in upland rice cultivation. Upland rice grown with local varieties, without inputs used and often affected by environmental stress so that the yield obtained very low from 1.5 to 1.7 tons per hectare.

Cassava and sugarcane are considered as the second upland crops. Cassava varieties consisted of Xanh Vinh Phu and KM 94 etc were commonly used by farmers in this area. In surveyed villages, cassava was mostly cultivated in the steepland and midland area where having poor soil fertility. Land preparation mostly done by hoe and manpower, cattle power could not use in this area because of high slope. The input used for cassava was quite low, average nitrogen application ranged from 27.9 to 54.8 kg per hectare, phosphorous ranged from 22.7 to 35.0 kg per hectare. The potassium and FYM did not use for cassava in production. Weeding was conducted for cassava one time per crop before leaves closing (Table 7, Table 8). The low input use and environmental stresses, such as drought and soil erosion have often affected, which were major causes of the low soil fertility and low productivity after several cultivated years so that the yield of cassava obtained was quite low as compare with other regions, it varied from 15.2 to 17.6 tons per hectare.

Sugarcane was planted mainly in the midland area. Most of the farmer produces sugarcane under contraction with Son La and Hoa Binh sugar factories. The common variety was used is ROC and input use for sugarcane consisted of FYM, nitrogen, phosphorous and potassium that were supported by sugar companies. Average input applied for sugarcane: FYM from 3.2 to 5.2 tons per hectare; nitrogen from 131.1 to 167.9 kg per hectare, and phosphorus from 23.5 to 51.9 kg per hectare, potassium from 80.2 to 117.3 kg per hectare within surveyed villages. The weed and pest control time were conducted from 1.0 to 2.0 times per crop in growing season. Consequently, the average sugarcane yield obtained from 34.0 to 42.0 tons per hectare (Table 7, Table 8).

Table 7 Farmer's practice in some food crops production

Items	Unit	L.land rice		Upland rice		Cassava		Sugarcane		Soybean	
		Amount	SD	Amount	SD	Amount	SD	Amount	SD	Amount	SD
<b><u>Ang village</u></b>											
Local variety		N	-	Y	-	Y	-	-	-	N	-
Modern variety		Y	-	N	-	N	-	-	-	Y	-
Plowing	times	1.5	0.50	1.0	0.0	1.0	0.0	-	-	1.3	0.5
Harrowing	times	1.4	0.51	1.0	0.0	1.0	0.0	-	-	1.2	0.5
Sowing		N	-	Y	-	Y	-	-	-	Y	-
Transplanting		Y	-	N	-	N	-	-	-	N	-
FYM	t/ha	4.3	1.31	0.0	0.0	0.0	0.0	-	-	0.00	0.0
N	kg/ha	88.6	40.8	0.0	0.0	42.5	46.8	-	-	47.8	22.5
P <sub>2</sub> O <sub>5</sub>	kg/ha	63.4	54.6	0.0	0.0	22.7	21.5	-	-	25.2	22.4
K <sub>2</sub> O	kg/ha	80.2	41.8	0.0	0.0	0.00	0.0	-	-	0.00	0.0
Weeding	times	1.7	0.4	1.0	0.0	1.52	0.51	-	-	1.41	0.7
Pest control	times	2.2	1.0	0.0	0.0	0.0	0.0	-	-	1.70	0.9
Crop yield	t/ha	3.7	0.5	1.6	0.5	16.8	2.8	-	-	1.8	0.7
<b><u>Ban Hoa village</u></b>											
Local variety		Y	-	Y	-	Y	-	N	-	N	-
Modern variety		Y	-	N	-	N	-	Y	-	Y	-
Plowing	times	1.9	0.5	1.0	0.0	1.0	0.0	1.0	0.0	1.4	0.5
Harrowing	times	2.1	0.5	1.0	0.0	1.0	0.0	1.0	0.0	1.7	0.4
Sowing		N	-	Y	-	Y	-	Y	-	Y	-
Transplanting		Y	-	N	-	N	-	N	-	N	-
FYM	t/ha	2.9	2.51	0.0	0.0	0.0	0.0	4.47	1.9	0.0	0.0
N	kg/ha	74.9	32.9	0.0	0.0	27.9	30.8	154.4	26.1	57.1	11.9
P <sub>2</sub> O <sub>5</sub>	kg/ha	46.8	69.5	0.0	0.0	57.2	21.7	89.2	9.3	42.5	18.5
K <sub>2</sub> O	kg/ha	48.3	32.0	0.0	0.0	0.0	0.0	104.2	33.5	0.0	0.0
Weeding	times	2.00	0.0	1.0	0.0	1.08	0.76	2.2	0.4	2.3	0.6
Pest control	times	2.1	0.40	0.0	0.0	0.0	0.0	1.72	0.6	1.9	0.8
Crop yield	t/ha	4.5	0.8	1.5	0.4	15.1	2.85	40.8	11.4	2.03	0.3
<b><u>Co Noi Village</u></b>											

Local variety		Y	-	Y	-	Y	-	N	-	Y	-
Modern variety		Y	-	N	-	N	-	Y	-	N	-
Plowing	times	2.1	0.4	1.0	0.0	1.0	0.0	1.3	0.5	1.0	0.0
Harrowing	times	1.6	0.4	1.0	0.0	1.0	0.0	1.0	0.0	1.6	0.4
Sowing		N	-	Y	-	Y	-	Y	-	Y	-
Transplanting		Y	-	N	-	N	-	N	-	N	-
FYM	t/ha	4.7	2.7	0.0	0.0	0.0	0.0	5.2	1.4	0.0	0.0
N	kg/ha	106.9	31.2	0.0	0.0	34.4	35.7	167.9	24.9	70.8	28.2
P <sub>2</sub> O <sub>5</sub>	kg/ha	61.8	23.2	0.0	0.0	35.0	24.9	112.7	16.8	34.7	15.2
K <sub>2</sub> O	kg/ha	74.4	23.1	0.0	0.0	0.00	0.0	117.3	30.1	0.0	0.0
Weeding	times	2.03	0.7	1.0	0.0	1.09	0.55	2.27	0.5	2.2	0.52
Pest control	times	2.23	0.6	0.0	0.0	0.00	0.0	2.45	0.6	2.4	0.71
Crop yield	t/ha	4.6	0.5	1.7	0.4	17.6	3.1	42.7	11.2	2.25	0.4

Source: survey, 2002. Note Y= yes, N= no

Soybean was cultivated in small plots or mixed with other crops in the midland area. Soybean product mostly used in home consumption and provided to the local market. The common varieties were used, such as DT 84, AK 06, TN2 and Habinh variety. The input use for soybean consisted of nitrogen from 47.8 to 70.8 kg per hectare, phosphorous from 25.2 to 42.5 kg per hectare. The FYM and potassium were not be used for soybean due to lack of FYM and traditional cultivation techniques. The weed and pest control were conducted from 1.0 to 2.0 times in the growing season. The average soybean yield obtained from 1.8 to 2.0 tons per hectare (Table 7, Table 8).



Table 8. Farmer's practice in some food crops production

Items	Unit	L.land rice		Upland rice		Cassava		Sugarcane		Soybean	
		Amount	SD	Amount	SD	Amount	SD	Amount	SD	Amount	SD
<b>Chieng Ban</b>											
Local variety		Y	-	Y	-	Y	-	Y	-	Y	-
Modern variety		Y	-	N	-	N	-	N	-	N	-
Plowing	times	1.8	0.4	1.0	0.0	1.0	0.0	1.0	0.0	1.7	0.4
Harrowing	times	1.4	0.5	1.0	0.0	1.0	0.0	1.0	1.0	1.6	0.5
Sowing		N	-	Y	-	Y	-	Y	-	Y	-
Transplanting		Y	-	N	-	N	-	N	-	N	-
FYM	t/ha	4.35	2.1	0.0	0.0	0.00	0.00	3.2	2.0	1.4	0.9
N	kg/ha	85.9	30.6	0.0	0.0	54.8	39.3	131.0	26.8	57.7	36.2
P <sub>2</sub> O	kg/ha	61.9	24.9	0.0	0.0	31.6	28.0	89.1	11.7	30.2	28.3
K <sub>2</sub> O	kg/ha	82.8	39.5	0.0	0.0	0.00	0.0	80.2	47.5	0.0	0.0
Weeding	times	1.73	0.4	1.0	0.0	1.12	0.4	1.6	0.51	2.2	0.7
Pest control	times	2.23	0.7	0.0	0.0	0.00	0.0	1.3	0.50	1.8	0.9
Crop yield	t/ha	4.8	1.2	1.5	0.3	14.8	2.7	34.8	11.5	2.2	0.5

Source: survey, 2002. Note Y= yes, N= no

In general, government policy in land allocation was launched in 1993, which had opened the new opportunities for agricultural development. Together with other provinces, agricultural production in Son La province has been motivated. Especially, in importing the new varieties in production that made the crop yield increased remarkably. Moreover, the shifting of some cropping patterns such as sugarcane, cassava and maize from self-sufficiency to semi-commercial production type was considered as an important change in agricultural production. However, traditional cultivation techniques and low inputs use that were major causes of low crop productivity in the rainfed area. Therefore, to increase the value of agricultural sector, decision makers should focus on the some important crops such as maize, sugarcane, coffee etc suitable with the relative advantages of the province, in which new varieties and technology transfer are considered as key components to encourage and drive agricultural activities towards the trend of market economy.